PATENT ABSTRACTS OF JAPAN

(11)Publication number : **2000-287210**
(43)Date of publication of application : **13.10.2000**

(51)Int.Cl. **H04N 7/30**
H04N 1/41

(21)Application number : **11-091683**
(22)Date of filing : **31.03.1999**

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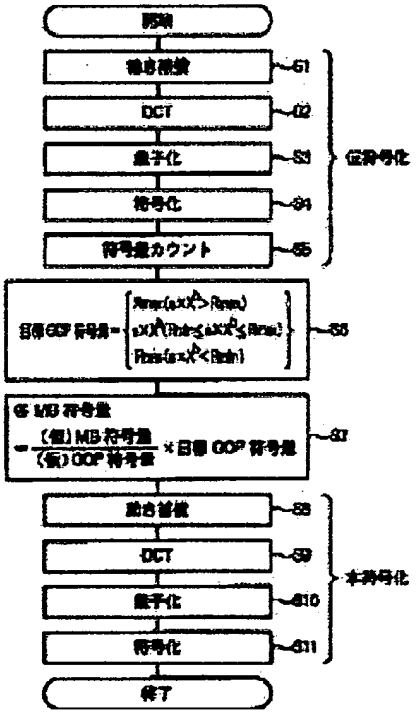
(54) METHOD AND UNIT FOR COMPRESSING IMAGE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a method and a unit that compress an image in a way that image quality of a complicated image is kept to be a prescribed level or over and image quality of a simple image is not excessively degraded.
SOLUTION: A lower limit Rmin of a minimum transfer rate is set in a step (S6) in order to suppress degradation in the image quality resulting from a decreased GOP rate of an image with less code quantity in the case of encoding an image at a variable transfer rate. Thus, the image compression is attained, where high sharpness is maintained as a whole while minimizing the image degradation of a comparatively complicated image pattern and not degrading the image quality of the image with a comparatively simple image pattern.



CLAIMS

[Claim(s)]

[Claim 1]An image compression method performing graphical data compression without decreasing a code amount which also sets up a lower limit in addition to upper limit of a target transfer rate, and is assigned for every image group in a method of coding a picture with a variable transfer rate to less than a specified value.

[Claim 2]An image compression method performing graphical data compression making said lower limit of a code amount assigned to each picture according to image quality which also sets up a lower limit in addition to upper limit of a target transfer rate, and is demanded for every image group in a method of coding a picture with a variable transfer rate fluctuate.

[Claim 3]In a method of coding a picture with a variable transfer rate, set up only upper limit of a target transfer rate and graphical data compression is performed, An image compression method performing graphical data compression storing a code amount of an excess or an insufficiency in a difference memory, and compensating a difference of the minimum transfer rate and a target rate with this storing code amount.

[Claim 4]A motion compensation section, a discrete cosine transform part, a quantizing part, a coding part, and a quantized control part are included. An image compression device setting up upper limit and a lower limit of a target transfer rate in this quantized control part, assigning a code amount for every image group, and performing suitable quantization by a quantizing part based on this assigned code amount.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention prevents a picture from the code amount assigned to a comparatively easy pattern becoming low more than needed, and deteriorating too much, and relates to an image compression method and equipment for the picture as the whole to be acquired most vividly.
[0002]
[Description of the Prior Art]When conveying picture information through a transfer line or carrying out memory accumulation, the image compression system for expressing with the number of bits small in whether this picture information is made is a technique useful for effective use of treatment capacity. The conventional image compression system is explained based on the flow chart of drawing 7 which illustrates the conventional image compression system. In this system, the coding by a variable transfer rate is performed in two steps, temporary coding and this coding. In temporary coding, it divides into the block called an inputted image macroblock, and this block unit performs motion-compensation-prediction coding (S21).
[0003]Next, a DCT coefficient is computed by carrying out a discrete cosine transform by a

block unit in a discrete cosine transform (DCT, Discrete Cosine Transform) part (S22), it quantizes using a standard quantized value by a quantizing part (S23), and variable length coding is performed in a coding part (S24). The code amount outputted here is accumulated with a code quantity counter (S25), and the code amount at the time of using a standard quantized value is calculated. In this coding, motion-compensation-prediction coding (S28), a discrete cosine transform (S29), and coding (S31) are performed like temporary coding. the image group (GOP, Group of Picture) called for by temporary coding when quantizing (S30) -- each time -- a total code amount is calculated from a generated code amount, performing nonlinear transformation, and a GOP rate is set up become the maximum in the range which does not exceed the capacity of a storage (storage medium). At this time, it restricts so that the GOP rate of a picture with many generated code amounts may not exceed maximum transfer rate Rmax of a recording medium.

[0004]The picture which is not fit for compression encoding since a motion is an intense pattern, and a picture which is close to Still Picture Sub-Division which can simplify compression encoding dramatically are included in the inputted image. Therefore, if it codes with a fixed transfer rate, as compared with an inputted image, the image quality of a complicated pattern will deteriorate substantially, and an easy pattern will serve as almost equivalent image quality. Then, by increasing the code amount assigned to a complicated pattern and lessening the code amount assigned to an easy pattern, even if an average transfer rate is low, a coding mode called the variable transfer rate which enabled it to realize high definition as the whole image quality is proposed. In performing the coding by this variable transfer rate, it carries out in two steps, the temporary coding for grasping beforehand the difficulty (complexity of a pattern, and violence of a motion) of compression of an inputted image, and this coding which codes by computing the amount of allocation codes for every GOP from the code amount obtained by temporary coding. When computing the amount of allocation codes for every GOP of this, upper limit was set up as above-mentioned, and it has restricted so that a GOP rate may not exceed the maximum transfer rate of a recording medium (for example, JP,H8-130736,A).

[0005]

[Problem to be solved by the invention]In the case where the coding by a fixed transfer rate is compared with the coding by a variable transfer rate on the occasion of subjectivity image evaluation, degradation of a picture which is close to Still Picture Sub-Division may be pointed out in the latter. This is because only upper limit is set up when computing the amount of allocation codes for every GOP, so a transfer rate may become low to a picture which is close to Still Picture Sub-Division more than needed and a quantized value may become high. If upper limit is low set up in order to control degradation of a picture which is close to Still Picture Sub-Division, since the code amount which the coding in which the maximum transfer rate of the recording medium was employed efficiently becomes impossible, and is assigned to a complicated pattern decreases, improvement in the image quality to a complicated pattern is not expectable. The graphical data compression indicated by above-mentioned JP,H8-130736,A means that it is going to set up the optimal quantization step from the difference of the generated code amount of quantization by the maximum/minimum of a quantization step, and cannot prevent excessive image quality deterioration of the picture of a comparatively easy pattern. Although JP,H10-164588,A, JP,H10-215460,A, JP,H10-234037,A, etc. are otherwise indicating graphical data compression, neither is indicating a means to prevent the excessive image quality deterioration of the picture of a comparatively easy pattern. An object of this invention is to

provide the method and equipment which can perform graphical data compression so that image quality of an easy picture may not be degraded too much, maintaining the image quality of a complicated picture more than a predetermined level.
[0006]
[Means for solving problem]In the way this invention method codes a picture with a variable transfer rate, In addition to the upper limit of a target transfer rate, a lower limit is also set up, it is an image compression method performing graphical data compression without decreasing the code amount assigned for every image group to less than a specified value, and graphical data compression may be performed, making a lower limit fluctuate for every picture. This invention equipment A motion compensation section, a discrete cosine transform part, a quantizing part, a coding part, It is an image compression device performing suitable quantization by a quantizing part so that the upper limit and lower limit of a target transfer rate may also be set up in this quantized control part including a quantized control part, a code amount may be assigned for every image group and it may become this assigned code amount.
[0007]This invention is explained in detail below. In the coding by the variable transfer rate which can change the code amount which gives this invention for every image group, When setting up the target transfer rate for every GOP, upper limit and a lower limit are set up, The composition which can control degradation of image quality as the code amount which the code amount assigned to a complicated pattern by upper limit as compared with the coding by a fixed transfer rate is increased, and image quality is raised, and is assigned to an easy pattern by a lower limit does not become low more than needed is provided.
[0008]In the image compression method which uses the usual variable transfer rate, a chief aim is placed by performing graphical data compression, without degrading the image quality of the picture of a complicated pattern, and the code amount assigned decreases about the picture of a comparatively easy pattern. . in order to compensate it so that especially the pattern of the former picture becomes complicated -- the code amount assigned to the picture of a comparatively easy pattern will decrease too much, and image quality will deteriorate. If degradation becomes severe even if it is a picture of a comparatively easy pattern, the adverse effect to the whole picture will become large, and the image quality deterioration more than the part of the picture of a complicated pattern which carries out image quality improvement becomes remarkable. according to this invention method -- the improvement in image quality of the picture of a complicated pattern -- a little -- or -- even if it uses a sacrifice, the excessive image quality deterioration of the picture of a comparatively easy pattern can be controlled, and the color definition of the whole picture can be maintained highly.
[0009]
[Mode for carrying out the invention]Next, although the embodiment of the graphical data compression concerning this invention is described based on the example shown in an accompanying drawing, this embodiment does not limit this invention. The flow chart which shows the process of a series [drawing 1] of the image compression method of this invention, the flow chart with which drawing 2 shows the relation of each process of temporary coding of drawing 1 and coding, and drawing 3 are flow charts which show the internal configuration of the quantized control part of drawing 2 in detail. As shown in drawing 2, the image compression means of this embodiment, For example, one picture is divided into the block called the macroblock which comprises 16x16 pixels, The motion compensation section 2 which performs motion-compensation-prediction coding by this block unit, for example, the DCT section which

performs a discrete cosine transform by an 8x8-pixel block unit, The data outputted from the quantizing part 4 which does division by the coefficient called a quantized value in the conversion factor outputted from this DCT section, and this quantizing part 4 with redundancy compression encoding systems, such as Huffman encoding. It comprises the coding part 5 to compress, the quantized control part 7 which sets up a quantized value from the code amount outputted from this coding part, and the storage 6 which accumulates a mark.

[0010]Next, operation of the whole image compression means which has such composition is explained in detail. At the motion compensation section 2 which the standardization by MPEG (Moving Picture Experts Group) accomplishes, a code amount is changed with the cycle of GOP from coding structure. Then, a change of a transfer rate is made GOP units and performed in two steps, temporary coding and this coding of the coding by a variable transfer rate. In temporary coding, it divides into the block called the macroblock which the inputted image 1 comprises the motion compensation section 2, and comprises 16x16 pixels in one picture first, and this block unit performs motion-compensation-prediction coding (S1).

[0011]Next, in DCT section 3, a DCT coefficient is computed by carrying out a discrete cosine transform by an 8x8-pixel block unit (S2), it quantizes using the standard quantized value 705 by the quantizing part 4 (S3), and the coding part 5 performs variable length coding (S4). The code amount outputted here is accumulated with the code quantity counter 701 (S5), and the code amount at the time of finally using the standard quantized value 705 is calculated. On the other hand by this coding, motion-compensation-prediction coding (S8), a discrete cosine transform (S9), and coding (S11) are performed like temporary coding. When quantizing (S10), a total code amount is calculated from generated code amount Gi' for every GOP required in temporary coding, performing nonlinear transformation. Changing a nonlinear transformation coefficient, the GOP rate Gi is set up by the GOP rate setting part 703 so that the total code amount stored in the code amount memory 702 may serve as the maximum in the range which does not exceed the capacity of the storage medium (recording medium) 6. At this time, it restricts so that the GOP rate of a picture with many generated code amounts may not exceed maximum transfer rate Rmax of a recording medium. Minimum transfer rate Rmin for the GOP rate of a picture with few generated code amounts to become low, and control degradation of image quality is set up (S6). Transform-function f(x) becomes like a following formula.

[0012]

[Formula 1]

$$f(x)=\begin{cases} Rmax\ (a\times X^{b} > Rmax) \\ a\times X^{b}\ (Rmin \leq a\times X^{b} \leq Rmax) \\ Rmin\ (a\times X^{b} < Rmin) \end{cases}$$

ただし、a>0．b<1．a．bは定数

[0013]

[Formula 2]

$$\max\left\{\sum_{i=0}^{K-1} Gi\right\} \leq (\text{記録媒体容量})$$

ただしKはGOP総数

[0014]

[Formula 3]

$$Gi = f(Gi')$$

[0015] a and b which satisfy the (formula 1) and the (formula 2) are computed, function f(x) is determined, and (the formula 3) is set up as a target transfer rate for every GOP. The parameter in a formula, a maximum transfer rate, and the minimum transfer rate can be set up timely according to an inputted image. As shown in drawing 3, within the quantized control part 7, the code amount outputted from the coding part 5 in the case of temporary coding is accumulated with the code quantity counter 701, and the value is stored in the code amount memory 702. In the GOP rate setting part 703 following it, it is determined that the coefficient (a and b) of a function will not exceed restriction of a target total code amount (capacity of a recording medium), and the maximum / the minimum code amount for the total code amount stored in the code amount memory in the case of this coding. In the code amount quota part 704, the code amount is assigned from the set-up GOP rate by the same ratio as the generated code amount of MB unit [as opposed to a code amount by temporary coding]. It is made to perform suitable quantization by the quantizing part 4 so that it may become the assigned code amount. Under the present circumstances, it sets up not exceed the capacity of a video buffer.

[0016]Drawing 4 is a flow chart which shows the internal configuration of the quantized control part 7a of other embodiments of the image compression means in this invention method in detail. A coefficient decision is made in the quantized control part 7a of this embodiment, without taking the conditions of a lower limit into consideration for the time being. When the GOP rate which exists at the time of GOP rate setting out turns into a rate which is less than the minimum transfer rate, a code amount is added to that GOP rate, and it raises to the minimum transfer rate, and the difference of an original transfer rate and the minimum transfer rate is stored in this case. A generated code amount is controlled below at a target, and it is made for remainder to arise in a code amount by setting up a target GOP rate low in the case of the coding after this GOP (it is small about a coefficient). In order to raise to the minimum transfer rate which mentioned above the remainder generated here, it is made for a code amount to turn into tales doses as total by assigning the code amount added and consumed. Thereby, the processing at the time of a coefficient set is mitigable (one condition decreases).

[0017]According to the target code quantity of each macroblock, feedback control of a quantized value is performed by the quantizing parts 7 and 7a. Since the target code quantity of each macroblock is based on the actual code amount obtained by temporary coding, control can be performed by being stabilized. Drawing 5 is Graf who shows each time of a fixed transfer rate (drawing 5 a), the conventional variable transfer rate (drawing 5 b), and the variable transfer rate (5c) of this embodiment, and the relation of a code amount. By setting up upper limit and a lower

limit, when asking for the transfer rate for every GOP, as shown in drawing 5, Improvement in image quality can be aimed at to the picture (intense picture of a motion) which can control degradation of image quality to a picture which is close to Still Picture Sub-Division which can perform compression encoding easily, and is not fit for compression encoding as compared with a fixed transfer rate. That is, the quantized value of a portion with few code amounts becomes low by setting up the lower limit of a code amount, and according to this embodiment, control of a quantized value which takes between conventional fixed transfer rates and variable transfer rates can be performed. The relation of the image quality to each picture of a fixed transfer rate, the conventional variable transfer rate, and the variable transfer rate of this embodiment is as follows.

[0018]Still Picture Sub-Division: The variable transfer rate > book embodiment > fixed transfer rate [0019] of the picture:former with an intense variable transfer rate motion of the fixed transfer rate > book embodiment > former Drawing 6 is a graph which shows the time at the time of setting to the case (drawing 6 a) where a lower limit is set up low, highly (drawing 6 b), and the relation of a code amount. [If a lower limit is made low like drawing 6 a, and it brings close to the minimum transfer rate of 0 bps (bit per second)], many code amounts in a picture with many generated code amounts can be assigned, and the image quality of the intense picture of a motion will improve. Although many code amounts in a picture with many generated code amounts cannot be assigned by what (the minimum transfer rate is brought close to an average transfer rate) a lower limit is highly set up for, since a generated code amount can assign a code amount to few pictures, degradation of the image quality of a picture like Still Picture Sub-Division can be controlled. Thus, the maximum transfer rate can change assignment of a code amount by setting out of a lower limit also with the same value.

[0020]

[Effect of the Invention]In the method of coding a picture with a variable transfer rate, this invention is an image compression method performing graphical data compression without decreasing the code amount which also sets up a lower limit in addition to the upper limit of a target transfer rate, and is assigned for every image group to less than a specified value. According to this technique, increase the code amount assigned to a complicated pattern by upper limit like conventional technology, and the image quality of this complicated pattern it is not only raised, but, As the code amount assigned to an easy pattern by a lower limit does not become low more than needed, degradation of the image quality of this easy pattern can be controlled to the minimum. Therefore, all the usable code amounts can be used most efficiently and the graphical data compression of the level which is not in the former becomes possible.

[0021]In this invention, between a series of graphical-data-compression processes, if it is not necessary to fix upper limit and a lower limit to constant value, it crawls on both again corresponding to the picture currently processed in process and it makes it fluctuate whether it is a gap, more suitable graphical data compression can be carried out. It is not necessary to necessarily set up a lower limit, a difference with the minimum transfer rate is stored in a difference memory, and it may be made to control the image quality deterioration as the whole by this invention method by using it in order to compensate a part for an excess with an insufficiency. This invention equipment A motion compensation section, a discrete cosine transform part, a quantizing part, a coding part, In this quantized control part, set up the upper limit and lower limit of a target transfer rate including a quantized control part, and a code amount is assigned for every image group, It is an image compression device performing suitable

quantization by a quantizing part based on this assigned code amount, and excessive degradation of the image quality of the picture of an easy pattern can be controlled, maintaining the image quality of the picture of a comparatively complicated pattern mostly for the same Reason by using this equipment.

TECHNICAL FIELD

[The technical field to which invention belongs] This invention prevents a picture from the code amount assigned to a comparatively easy pattern becoming low more than needed, and deteriorating too much, and relates to an image compression method and equipment for the picture as the whole to be acquired most vividly.

PRIOR ART

[Description of the Prior Art]When conveying picture information through a transfer line or carrying out memory accumulation, the image compression system for expressing with the number of bits small in whether this picture information is made is a technique useful for effective use of treatment capacity. The conventional image compression system is explained based on the flow chart of drawing 7 which illustrates the conventional image compression system. In this system, the coding by a variable transfer rate is performed in two steps, temporary coding and this coding. In temporary coding, it divides into the block called an inputted image macroblock, and this block unit performs motion-compensation-prediction coding (S21).
[0003]Next, a DCT coefficient is computed by carrying out a discrete cosine transform by a block unit in a discrete cosine transform (DCT, Discrete Cosine Transform) part (S22), it quantizes using a standard quantized value by a quantizing part (S23), and variable length coding is performed in a coding part (S24). The code amount outputted here is accumulated with a code quantity counter (S25), and the code amount at the time of using a standard quantized value is calculated. In this coding, motion-compensation-prediction coding (S28), a discrete cosine transform (S29), and coding (S31) are performed like temporary coding. the image group (GOP, Group of Picture) called for by temporary coding when quantizing (S30) -- each time -- a total code amount is calculated from a generated code amount, performing nonlinear transformation, and a GOP rate is set up become the maximum in the range which does not exceed the capacity of a storage (storage medium). At this time, it restricts so that the GOP rate of a picture with many generated code amounts may not exceed maximum transfer rate Rmax of a recording medium.
[0004]The picture which is not fit for compression encoding since a motion is an intense pattern, and a picture which is close to Still Picture Sub-Division which can simplify compression encoding dramatically are included in the inputted image. Therefore, if it codes with a fixed transfer rate, as compared with an inputted image, the image quality of a complicated pattern will deteriorate substantially, and an easy pattern will serve as almost equivalent image quality. Then, by increasing the code amount assigned to a complicated pattern and lessening the code amount

assigned to an easy pattern, even if an average transfer rate is low, a coding mode called the variable transfer rate which enabled it to realize high definition as the whole image quality is proposed. In performing the coding by this variable transfer rate, it carries out in two steps, the temporary coding for grasping beforehand the difficulty (complexity of a pattern, and violence of a motion) of compression of an inputted image, and this coding which codes by computing the amount of allocation codes for every GOP from the code amount obtained by temporary coding. When computing the amount of allocation codes for every GOP of this, upper limit was set up as above-mentioned, and it has restricted so that a GOP rate may not exceed the maximum transfer rate of a recording medium (for example, JP,H8-130736,A).

EFFECT OF THE INVENTION

[Effect of the Invention]In the method of coding a picture with a variable transfer rate, this invention is an image compression method performing graphical data compression without decreasing the code amount which also sets up a lower limit in addition to the upper limit of a target transfer rate, and is assigned for every image group to less than a specified value. According to this technique, increase the code amount assigned to a complicated pattern by upper limit like conventional technology, and the image quality of this complicated pattern it is not only raised, but, As the code amount assigned to an easy pattern by a lower limit does not become low more than needed, degradation of the image quality of this easy pattern can be controlled to the minimum. Therefore, all the usable code amounts can be used most efficiently and the graphical data compression of the level which is not in the former becomes possible.
[0021]In this invention, between a series of graphical-data-compression processes, if it is not necessary to fix upper limit and a lower limit to constant value, it crawls on both again corresponding to the picture currently processed in process and it makes it fluctuate whether it is a gap, more suitable graphical data compression can be carried out. It is not necessary to necessarily set up a lower limit, a difference with the minimum transfer rate is stored in a difference memory, and it may be made to control the image quality deterioration as the whole by this invention method by using it in order to compensate a part for an excess with an insufficiency. This invention equipment A motion compensation section, a discrete cosine transform part, a quantizing part, a coding part, It is an image compression device setting up the upper limit and lower limit of a target transfer rate in this quantized control part including a quantized control part, assigning a code amount for every image group, and performing suitable quantization by a quantizing part based on this assigned code amount.
Excessive degradation of the image quality of the picture of an easy pattern can be controlled maintaining the image quality of the picture of a comparatively complicated pattern mostly for the same Reason by using this equipment.

TECHNICAL PROBLEM

[Problem to be solved by the invention]In the case where the coding by a fixed transfer rate is compared with the coding by a variable transfer rate on the occasion of subjectivity image evaluation, degradation of a picture which is close to Still Picture Sub-Division may be pointed out in the latter. This is because only upper limit is set up when computing the amount of allocation codes for every GOP, so a transfer rate may become low to a picture which is close to Still Picture Sub-Division more than needed and a quantized value may become high. If upper limit is low set up in order to control degradation of a picture which is close to Still Picture Sub-Division, since the code amount which the coding in which the maximum transfer rate of the recording medium was employed efficiently becomes impossible, and is assigned to a complicated pattern decreases, improvement in the image quality to a complicated pattern is not expectable. The graphical data compression indicated by above-mentioned JP,H8-130736,A means that it is going to set up the optimal quantization step from the difference of the generated code amount of quantization by the maximum/minimum of a quantization step, and cannot prevent excessive image quality deterioration of the picture of a comparatively easy pattern. Although JP,H10-164588,A, JP,H10-215460,A, JP,H10-234037,A, etc. are otherwise indicating graphical data compression, neither is indicating a means to prevent the excessive image quality deterioration of the picture of a comparatively easy pattern. An object of this invention is to provide the method and equipment which can perform graphical data compression so that image quality of an easy picture may not be degraded too much, maintaining the image quality of a complicated picture more than a predetermined level.
[0006]

MEANS

[Means for solving problem]In the way this invention method codes a picture with a variable transfer rate, In addition to the upper limit of a target transfer rate, a lower limit is also set up, it is an image compression method performing graphical data compression without decreasing the code amount assigned for every image group to less than a specified value, and graphical data compression may be performed, making a lower limit fluctuate for every picture. This invention equipment A motion compensation section, a discrete cosine transform part, a quantizing part, a coding part, It is an image compression device performing suitable quantization by a quantizing part so that the upper limit and lower limit of a target transfer rate may also be set up in this quantized control part including a quantized control part, a code amount may be assigned for every image group and it may become this assigned code amount.
[0007]This invention is explained in detail below. In the coding by the variable transfer rate which can change the code amount which gives this invention for every image group, When setting up the target transfer rate for every GOP, upper limit and a lower limit are set up, The composition which can control degradation of image quality as the code amount which the code amount assigned to a complicated pattern by upper limit as compared with the coding by a fixed transfer rate is increased, and image quality is raised, and is assigned to an easy pattern by a lower limit does not become low more than needed is provided.
[0008]In the image compression method which uses the usual variable transfer rate, a chief aim is placed by performing graphical data compression, without degrading the image quality of the

picture of a complicated pattern, and the code amount assigned decreases about the picture of a comparatively easy pattern. . in order to compensate it so that especially the pattern of the former picture becomes complicated -- the code amount assigned to the picture of a comparatively easy pattern will decrease too much, and image quality will deteriorate. If degradation becomes severe even if it is a picture of a comparatively easy pattern, the adverse effect to the whole picture will become large, and the image quality deterioration more than the part of the picture of a complicated pattern which carries out image quality improvement becomes remarkable. according to this invention method -- the improvement in image quality of the picture of a complicated pattern -- a little -- or -- even if it uses a sacrifice, the excessive image quality deterioration of the picture of a comparatively easy pattern can be controlled, and the color definition of the whole picture can be maintained highly.

[0009]

[Mode for carrying out the invention]Next, although the embodiment of the graphical data compression concerning this invention is described based on the example shown in an accompanying drawing, this embodiment does not limit this invention. The flow chart which shows the process of a series [drawing 1] of the image compression method of this invention, the flow chart with which drawing 2 shows the relation of each process of temporary coding of drawing 1 and coding, and drawing 3 are flow charts which show the internal configuration of the quantized control part of drawing 2 in detail. As shown in drawing 2, the image compression means of this embodiment, For example, one picture is divided into the block called the macroblock which comprises 16x16 pixels, The motion compensation section 2 which performs motion-compensation-prediction coding by this block unit, for example, the DCT section which performs a discrete cosine transform by an 8x8-pixel block unit, The data outputted from the quantizing part 4 which does division by the coefficient called a quantized value in the conversion factor outputted from this DCT section, and this quantizing part 4 with redundancy compression encoding systems, such as Huffman encoding. It comprises the coding part 5 to compress, the quantized control part 7 which sets up a quantized value from the code amount outputted from this coding part, and the storage 6 which accumulates a mark.

[0010]Next, operation of the whole image compression means which has such composition is explained in detail. At the motion compensation section 2 which the standardization by MPEG (Moving Picture Experts Group) accomplishes, a code amount is changed with the cycle of GOP from coding structure. Then, a change of a transfer rate is made GOP units and performed in two steps, temporary coding and this coding of the coding by a variable transfer rate. In temporary coding, it divides into the block called the macroblock which the inputted image 1 comprises the motion compensation section 2, and comprises 16x16 pixels in one picture first, and this block unit performs motion-compensation-prediction coding (S1).

[0011]Next, in DCT section 3, a DCT coefficient is computed by carrying out a discrete cosine transform by an 8x8-pixel block unit (S2), it quantizes using the standard quantized value 705 by the quantizing part 4 (S3), and the coding part 5 performs variable length coding (S4). The code amount outputted here is accumulated with the code quantity counter 701 (S5), and the code amount at the time of finally using the standard quantized value 705 is calculated. On the other hand by this coding, motion-compensation-prediction coding (S8), a discrete cosine transform (S9), and coding (S11) are performed like temporary coding. When quantizing (S10), a total code amount is calculated from generated code amount Gi' for every GOP required in temporary coding, performing nonlinear transformation. Changing a nonlinear transformation coefficient,

the GOP rate Gi is set up by the GOP rate setting part 703 so that the total code amount stored in the code amount memory 702 may serve as the maximum in the range which does not exceed the capacity of the storage medium (recording medium) 6. At this time, it restricts so that the GOP rate of a picture with many generated code amounts may not exceed maximum transfer rate Rmax of a recording medium. Minimum transfer rate Rmin for the GOP rate of a picture with few generated code amounts to become low, and control degradation of image quality is set up (S6). Transform-function f(x) becomes like a following formula.

[0012]

[Formula 1]

$$f(x)=\begin{cases} Rmax\ (a\times X^{b} > Rmax) \\ a\times X^{b}\ (Rmin \leq a\times X^{b} \leq Rmax) \\ Rmin\ (a\times X^{b} < Rmin) \end{cases}$$

ただし、a>0，b<1，a，bは定数

[0013]

[Formula 2]

$$\max\left\{\sum_{i=0}^{K-1} Gi\right\} \leq (記録媒体容量)$$

ただしKはGOP総数

[0014]

[Formula 3]

$$Gi = f(Gi')$$

[0015] a and b which satisfy the (formula 1) and the (formula 2) are computed, function f(x) is determined, and (the formula 3) is set up as a target transfer rate for every GOP. The parameter in a formula, a maximum transfer rate, and the minimum transfer rate can be set up timely according to an inputted image. As shown in drawing 3, within the quantized control part 7, the code amount outputted from the coding part 5 in the case of temporary coding is accumulated with the code quantity counter 701, and the value is stored in the code amount memory 702. In the GOP rate setting part 703 following it, it is determined that the coefficient (a and b) of a function will not exceed restriction of a target total code amount (capacity of a recording medium), and the maximum / the minimum code amount for the total code amount stored in the

code amount memory in the case of this coding. In the code amount quota part 704, the code amount is assigned from the set-up GOP rate by the same ratio as the generated code amount of MB unit [as opposed to a code amount by temporary coding]. It is made to perform suitable quantization by the quantizing part 4 so that it may become the assigned code amount. Under the present circumstances, it sets up not exceed the capacity of a video buffer.

[0016]Drawing 4 is a flow chart which shows the internal configuration of the quantized control part 7a of other embodiments of the image compression means in this invention method in detail. A coefficient decision is made in the quantized control part 7a of this embodiment, without taking the conditions of a lower limit into consideration for the time being. When the GOP rate which exists at the time of GOP rate setting out turns into a rate which is less than the minimum transfer rate, a code amount is added to that GOP rate, and it raises to the minimum transfer rate, and the difference of an original transfer rate and the minimum transfer rate is stored in this case. A generated code amount is controlled below at a target, and it is made for remainder to arise in a code amount by setting up a target GOP rate low in the case of the coding after this GOP (it is small about a coefficient). In order to raise to the minimum transfer rate which mentioned above the remainder generated here, it is made for a code amount to turn into tales doses as total by assigning the code amount added and consumed. Thereby, the processing at the time of a coefficient set is mitigable (one condition decreases).

[0017]According to the target code quantity of each macroblock, feedback control of a quantized value is performed by the quantizing parts 7 and 7a. Since the target code quantity of each macroblock is based on the actual code amount obtained by temporary coding, control can be performed by being stabilized. Drawing 5 is a graph which shows each time of a fixed transfer rate (drawing 5 a), the conventional variable transfer rate (drawing 5 b), and the variable transfer rate (5c) of this embodiment, and the relation of a code amount. By setting up upper limit and a lower limit, when asking for the transfer rate for every GOP, as shown in drawing 5, Improvement in image quality can be aimed at to the picture (intense picture of a motion) which can control degradation of image quality to a picture which is close to Still Picture Sub-Division which can perform compression encoding easily, and is not fit for compression encoding as compared with a fixed transfer rate. That is, the quantized value of a portion with few code amounts becomes low by setting up the lower limit of a code amount, and according to this embodiment, control of a quantized value which takes between conventional fixed transfer rates and variable transfer rates can be performed. The relation of the image quality to each picture of a fixed transfer rate, the conventional variable transfer rate, and the variable transfer rate of this embodiment is as follows.

[0018]Still Picture Sub-Division: The variable transfer rate > book embodiment > fixed transfer rate [0019] of the picture:former with an intense variable transfer rate motion of the fixed transfer rate > book embodiment > former Drawing 6 is a graph which shows the time at the time of setting to the case (drawing 6 a) where a lower limit is set up low, highly (drawing 6 b), and the relation of a code amount. [If a lower limit is made low like drawing 6 a, and it brings close to the minimum transfer rate of 0 bps (bit per second)], many code amounts in a picture with many generated code amounts can be assigned, and the image quality of the intense picture of a motion will improve. Although many code amounts in a picture with many generated code amounts cannot be assigned by what (the minimum transfer rate is brought close to an average transfer rate) a lower limit is highly set up for, since a generated code amount can assign a code amount to few pictures, degradation of the image quality of a picture like Still Picture Sub-

Division can be controlled. Thus, the maximum transfer rate can change assignment of a code amount by setting out of a lower limit also with the same value.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The flow chart which shows a series of processes of the image compression method of one embodiment of this invention.

[Drawing 2]The flow chart which shows the relation of each process of temporary coding of drawing 1, and coding.

[Drawing 3]The flow chart which shows the internal configuration of the quantized control part of drawing 2 in detail.

[Drawing 4]The flow chart which shows a series of processes of the image compression method of other embodiments of this invention.

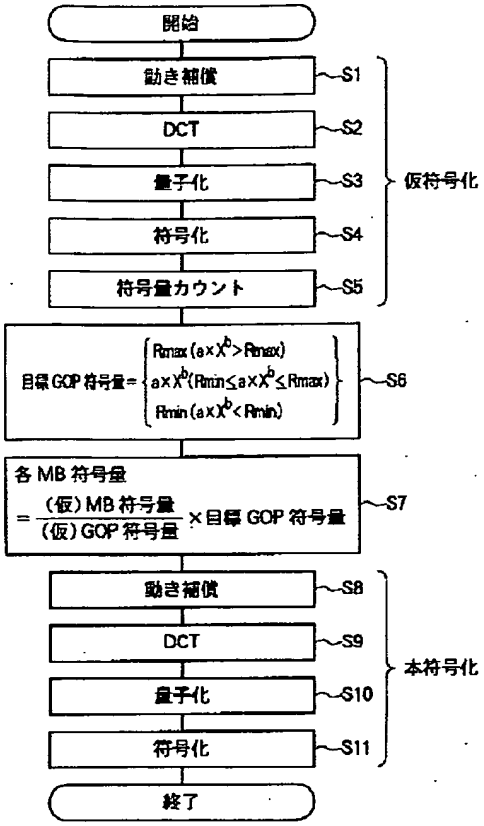
[Drawing 5]A fixed transfer rate (a), Graf who shows the relation between the time in the variable transfer rate of (b) and this embodiment (c), and a code amount conventionally.

[Drawing 6]The graph which shows the time of (b), and the relation of a code amount when a lower limit is low set up in the embodiment of this invention and it sets to (a) highly.

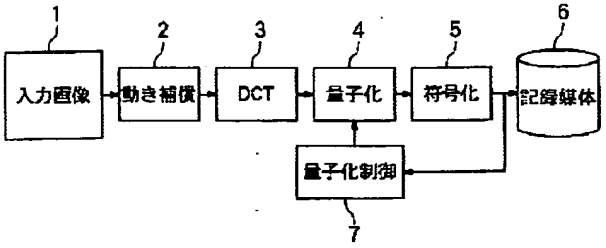
[Drawing 7]The flow chart which illustrates the conventional image compression system.
[Explanations of letters or numerals]
1 Inputted image
2 Motion compensation section
3 Discrete cosine transform part
4 Quantizing part
5 Coding part
6 Recording medium (storage medium)
7 Quantized control part
701 Code quantity counter
702 Code amount memory
703 GOP rate setting part
704 Mark quota part
705 Standard quantized value

DRAWINGS

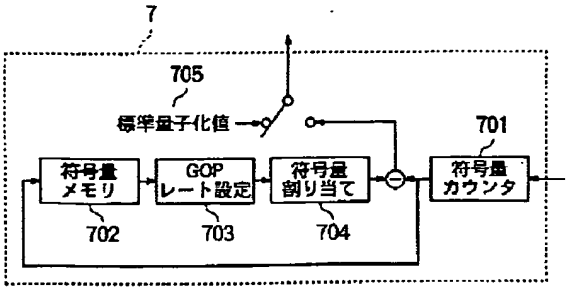
[Drawing 1]



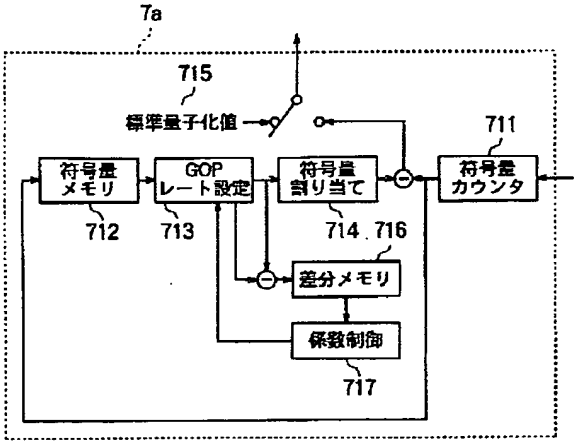
[Drawing 2]



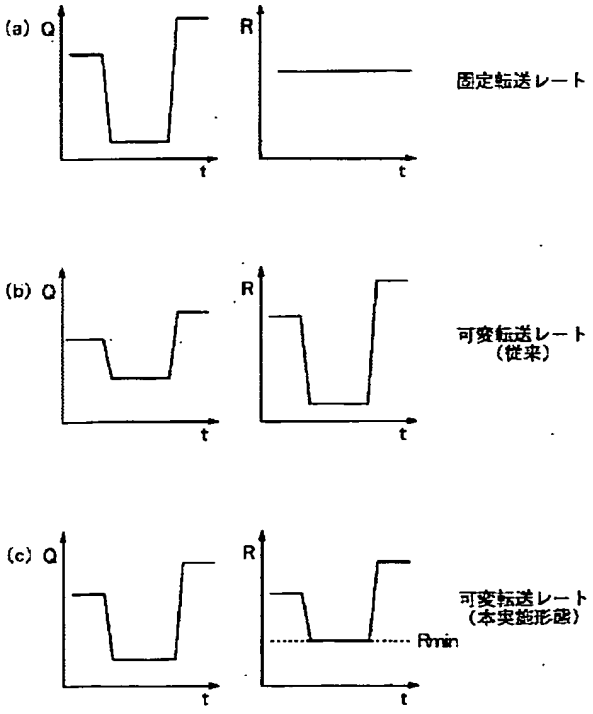
[Drawing 3]



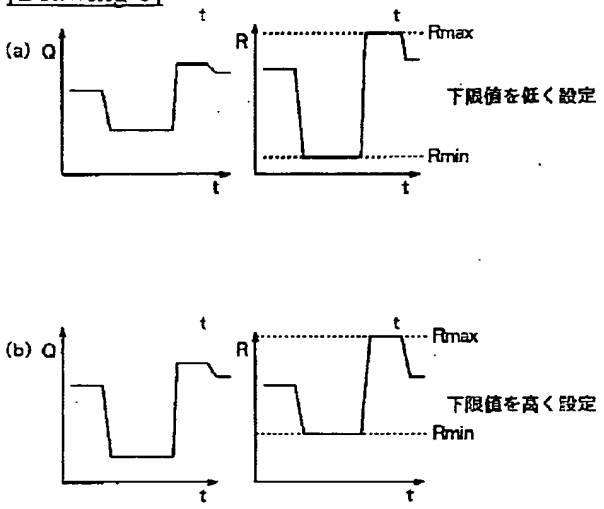
[Drawing 4]



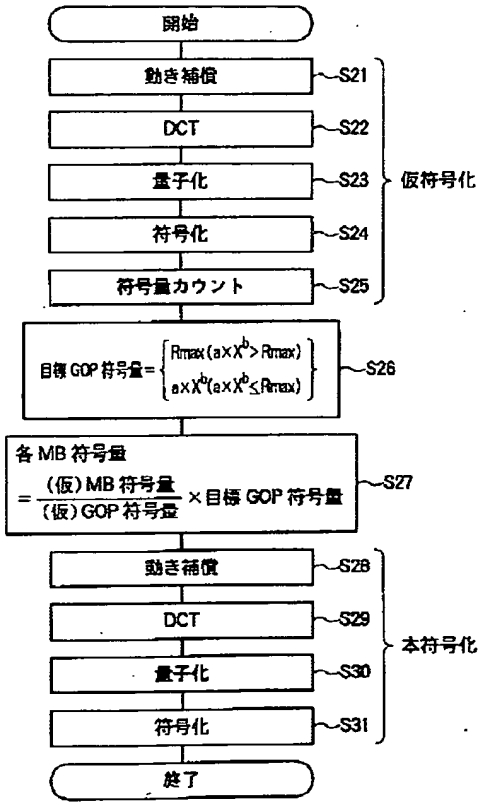
[Drawing 5]



[Drawing 6]



[Drawing 7]



(19)日本国特許庁（ＪＰ）　(12)**公開特許公報**（Ａ）　(11)特許出願公開番号
特開2000－287210
（P2000－287210A）
(43)公開日　平成12年10月13日(2000.10.13)

(51)Int.Cl.[7]	識別記号	ＦＩ		テーマコード（参考）
Ｈ０４Ｎ　7/30		Ｈ０４Ｎ　7/133	Ｚ	５Ｃ０５９
1/41		1/41	Ｂ	５Ｃ０７８
				９Ａ００１

審査請求　有　　請求項の数４　ＯＬ　（全７頁）

(21)出願番号　特願平11－91683

(22)出願日　平成11年３月31日(1999.3.31)

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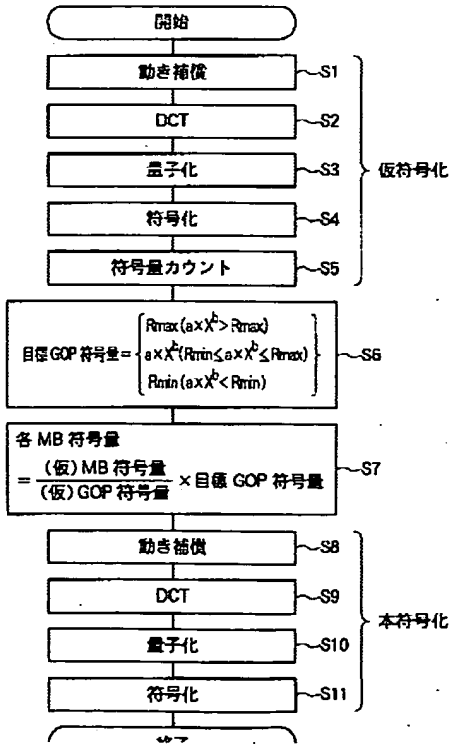
最終頁に続く

(54)【発明の名称】　画像圧縮方法及び装置

(57)【要約】
【課題】　従来の可変転送レートによる画像圧縮では、複雑な絵柄の画像の画質を維持することのみに主眼が置かれ、比較的簡単な絵柄の画像に割り当てられる符号量が少なくなり、この画像の画質の劣化が著しくなることがあった。
【解決手段】　画像を可変転送レートにより符号化する際に、発生符号量が少ない画像のＧＯＰレートが低くなり画質の劣化を抑制するために最小転送レートの下限値Rmin としてステップ（Ｓ６）で設定する。これにより、本発明では従来の可変転送レートによる画像圧縮と比較して、比較的複雑な絵柄の画像劣化を最小限に抑制した上で、比較的簡単な絵柄の画像の画質をかどにら劣化させず、全体として高い鮮明度を維持した画像圧縮を可能にする。



【特許請求の範囲】
【請求項１】　画像を可変転送レートにより符号化する方法において、目標転送レートの上限値に加えて下限値も設定し、画像群毎に割り当てられる符号量を所定値未満に減少させずに画像圧縮を行うことを特徴とする画像圧縮方法。
【請求項２】　画像を可変転送レートにより符号化する方法において、目標転送レートの上限値に加えて下限値も設定し、画像群毎に要求される画質に応じて各画像に割り当てられる符号量の前記下限値を増減させながら画像圧縮を行うことを特徴とする画像圧縮方法。
【請求項３】　画像を可変転送レートにより符号化する方法において、目標転送レートの上限値のみを設定して画像圧縮を行い、過剰又は不足分の符号量を差分メモリに格納し、この格納符号量により最小転送レートと目標レートとの差を補償しながら画像圧縮を行うことを特徴とする画像圧縮方法。
【請求項４】　動き補償部、離散コサイン変換部、量子化部、符号化部、量子化制御部を含んで成り、該量子化制御部において目標転送レートの上限値及び下限値を設定して画像群毎に符号量の割当てを行い、この割当てられた符号量に基づいて量子化部で適切な量子化を行うことを特徴とする画像圧縮装置。
【発明の詳細な説明】
【０００１】
【発明が属する技術分野】本発明は、比較的簡単な絵柄に割り当てられる符号量が必要以上に低くなり画像が過度に劣化することを防止し、全体としての画像が最も鮮明に得られるようにするための画像圧縮方法及び装置に関する。
【０００２】
【従来の技術】画像情報を転送路を通して搬送したり記憶蓄積したりする際に、該画像情報をできるかぎり少ないビット数で表現するための画像圧縮方式は処理容量の有効活用のために有用な手法である。従来の画像圧縮方式を、従来の画像圧縮方式を例示する図７のフローチャートに基づいて説明する。該方式では、可変転送レートによる符号化を仮符号化と本符号化の２段階で行う。仮符号化では、入力画像マクロブロックと呼ばれるブロックに分割しこのブロック単位で動き補償予測符号化を行う（Ｓ21）。
【０００３】次に離散コサイン変換（ＤＣＴ、Discrete Cosine Transform)部でブロック単位で離散コサイン変換してＤＣＴ係数を算出し（Ｓ22）、量子化部で標準量子化値を用いて量子化し（Ｓ23）、符号化部で可変長符号化を行う（Ｓ24）。ここで出力される符号量を符号量カウンタで累算し（Ｓ25）、標準量子化値を用いた場合の符号量を求める。本符号化では、動き補償予測符号化（Ｓ28）、離散コサイン変換（Ｓ29）、符号化（Ｓ31）を仮符号化と同様に行う。量子化する（Ｓ30）際に、仮符号化で求められた画像群（ＧＯＰ、Group of Picture）毎の発生符号量に対して、非線形変換を施しながら総符号量を求め、記憶媒体（蓄積メディア）の容量を超えない範囲で最大となるようにＧＯＰレートの設定を行う。この時、発生符号量が多い画像のＧＯＰレートが記録媒体の最大転送レートRmax を超えないように制限しておく。
【０００４】入力画像には、動きが激しい絵柄であるために圧縮符号化に向かない画像と、圧縮符号化を非常に簡単にできる静止画に近いような画像が含まれている。従って固定転送レートで符号化すると、入力画像と比較すると複雑な絵柄の画質は大幅に低下し、簡単な絵柄はほぼ同等の画質となる。そこで複雑な絵柄に割り当てられる符号量を多くし、簡単な絵柄に割り当てる符号量を少なくすることにより、平均転送レートが低くても画質全体として高画質を実現できるようにした可変転送レートという符号化方式が提案されている。この可変転送レートによる符号化を行う場合には、入力画像の圧縮の難しさ（絵柄の複雑さや動きの激しさ）を予め把握するための仮符号化と、仮符号化で得られる符号量からＧＯＰ毎の割り当て符号量を算出し符号化を行う本符号化の２段階で行う。このＧＯＰ毎の割り当て符号量を算出する際に前述の通り上限値を設定し、ＧＯＰレートが記録媒体の最大転送レートを超えないように制限している（例えば特開平８－130736号公報）。
【０００５】
【発明が解決しようとする課題】主観画質評価の際に固定転送レートによる符号化と可変転送レートによる符号化を比較した場合では、後者において静止画に近いような画像の劣化が指摘されることがある。これはＧＯＰ毎の割り当て符号量を算出する際に上限値しか設定しないので、静止画に近いような画像に対して必要以上に転送レートが低くなり、量子化値が高くなることがあるからである。また、静止画に近いような画像の劣化を抑制するために上限値を低く設定すれば、記録媒体の最大転送レートを生かした符号化ができなくなり、複雑な絵柄に割り当てる符号量が減少するために複雑な絵柄に対する画質の向上が期待できない。前述の特開平８－130736号公報に開示された画像圧縮は、量子化ステップの最大値／最小値による量子化の発生符号量の差から最適な量子化ステップを設定しようとすることを意図し、比較的簡単な絵柄の画像の過度の画質劣化が防止できない。他にも特開平10－164588号公報、特開平10－215460号公報及び特開平10－234037号公報等が画像圧縮を開示しているが、いずれも比較的簡単な絵柄の画像の過度の画質劣化を防止する手段を開示していない。本発明は、複雑な画像の画質を所定レベル以上に維持しながら簡単な画像の画質を過度に劣化させないように画像圧縮を行うことのできる方法及び装置を提供することを目的とする。
【０００６】

【課題を解決するための手段】本発明方法は、画像を可変転送レートにより符号化する方法において、目標転送レートの上限値に加えて下限値も設定し、画像群毎に割り当てられる符号量を所定値未満に減少させずに画像圧縮を行うことを特徴とする画像圧縮方法であり、画像毎に下限値を増減させながら画像圧縮を行ってもよい。又本発明装置は、動き補償部、離散コサイン変換部、量子化部、符号化部、量子化制御部を含んで成り、該量子化制御部において目標転送レートの上限値及び下限値も設定して画像群毎に符号量の割当てを行い、この割当てられた符号量になるように量子化部で適切な量子化を行うことを特徴とする画像圧縮装置である。

【０００７】以下本発明を詳細に説明する。本発明は、各画像群毎に付与する符号量を変えることのできる可変転送レートによる符号化において、ＧＯＰ毎の目標転送レートを設定する際に上限値と下限値を設定し、固定転送レートによる符号化と比較して上限値によって複雑な絵柄に割り当てる符号量を多くして画質を向上させ、かつ下限値によって簡単な絵柄に割り当てる符号量が必要以上に低くならないようにして画質の劣化を抑制することができる構成を提供するものである。

【０００８】通常の可変転送レートを使用する画像圧縮方法では、複雑な絵柄の画像の画質を劣化させることなく画像圧縮を行うことに主眼が置かれ、比較的簡単な絵柄の画像については割り当てられる符号量が減少する。特に前者の画像の絵柄が複雑になるほどそれを補償するため．比較的簡単な絵柄の画像に割り当てられる符号量が過度に減少して画質が劣化してしまう。比較的簡単な絵柄の画像であっても劣化がひどくなると全体の画像への悪影響が大きくなり、複雑な絵柄の画像の画質向上させる分以上の画質劣化が顕著になる。本発明方法によると、複雑な絵柄の画像の画質向上を幾分か犠牲にしても、比較的簡単な絵柄の画像の過度の画質劣化を抑制することができ、全体の画像の鮮明度を高く維持できる。

【０００９】

【発明の実施の形態】次に本発明に係る画像圧縮の実施形態を添付図面に示す例に基づいて説明するが、該実施形態は本発明を限定するものではない。図１は，本発明の画像圧縮方法の一連の工程を示すフローチャート、図２は図１の仮符号化及び符号化の各工程の関連を示すフローチャート、図３は図２の量子化制御部の内部構成を詳細に示すフローチャートである。図２に示すように、本実施形態の画像圧縮手段は、例えば１画像を16×16画素で構成されるマクロブロックと呼ばれるブロックに分割し、このブロック単位で動き補償予測符号化を行う動き補償部２、例えば８×８画素のブロック単位で離散コサイン変換を行うＤＣＴ部、該ＤＣＴ部から出力された変換係数を量子化値と呼ばれる係数で除算を行う量子化部４、該量子化部４から出力されるデータをハフマン符号化等の可長性圧縮符号化方式によって圧縮する符号化部５、該符号化部から出力される符号量から量子化値を設定する量子化制御部７、符号を累算する記憶媒体６から構成される。

【００１０】次にこのような構成を有する画像圧縮手段の全体の動作について詳細に説明する。ＭＰＥＧ（Moving Picture Experts Group）による標準化が成される動き補償部２では符号化構造から符号量はＧＯＰの周期で変動する。そこで転送レートの変更はＧＯＰ単位とし、可変転送レートによる符号化を仮符号化と本符号化の２段階で行う。仮符号化では、入力画像１をまず動き補償部２で１画像を16×16画素で構成されるマクロブロックと呼ばれるブロックに分割しこのブロック単位で動き補償予測符号化を行う（Ｓ１）。

【００１１】次にＤＣＴ部３では８×８画素のブロック単位で離散コサイン変換してＤＣＴ係数を算出し（Ｓ２）、量子化部４で標準量子化値705 を用いて量子化し（Ｓ３）、符号化部５で可変長符号化を行う（Ｓ４）。ここで出力される符号量を符号量カウンタ701 で累算し（Ｓ５）、最後に標準量子化値705 を用いた場合の符号量を求める。一方本符号化では、動き補償予測符号化（Ｓ８）、離散コサイン変換（Ｓ９）、符号化（S11）を仮符号化と同様に行う。量子化する（S10）際に、仮符号化で求められたＧＯＰ毎の発生符号量Ｇｉ′に対して、非線形変換を施しながら総符号量を求める。非線形変換係数を変化させながら符号量メモリ702 に格納されている総符号量が蓄積メディア（記録媒体）６の容量を超えない範囲で最大となるようにＧＯＰレート設定部703 でＧＯＰレートＧｉの設定を行う。この時、発生符号量が多い画像のＧＯＰレートが記録媒体の最大転送レートRmax を超えないように制限しておく。また、発生符号量が少ない画像のＧＯＰレートが低くなり画質の劣化を抑制するための最小転送レートRmin を設定する（Ｓ６）。変換関数ｆ（ｘ）は次式のようになる。

【００１２】

【式１】

$$f(x)=\begin{cases} Rmax\ (a\times X^{b}>Rmax) \\ a\times X^{b}\ (Rmin\le a\times X^{b}\le Rmax) \\ Rmin\ (a\times X^{b}<Rmin) \end{cases}$$

ただし、a>0，b<1，a，bは定数

【００１３】

【式２】

$$\max\left\{\sum_{i=0}^{K-1} Gi\right\} \le (\text{記録媒体容量})$$

ただしＫはGOP総数

【００１４】

【式３】

$$Gi = f(Gi')$$

【００１５】（式１）及び（式２）を満足するａ、ｂを算出し、関数ｆ（ｘ）を決定して、（式３）を各ＧＯＰ毎の目標転送レートとして設定する。式中のパラメータ、最大転送レート、最小転送レートは入力画像に応じて適時設定できる。図３に示すように、量子化制御部７内では、仮符号化の際に符号化部５から出力される符号量を符号量カウンタ701 で累算し、その値を符号量メモリ702 に格納する。それに続くＧＯＰレート設定部703では本符号化の際に符号量メモリに格納されている総符号量を目標総符号量（記録媒体の容量）、最大／最小符号量の制限を超えないように関数の係数（ａ及びｂ）を決定する。符号量割当部704では設定されたＧＯＰレートから仮符号化で符号量に対するＭＢ単位の発生符号量と同じ比率で符号量を割り当てていく。割り当てられた符号量になるように量子化部４で適切な量子化を行うようにする。この際、ビデオバッファの容量を超えないように設定する。

【００１６】図４は、本発明方法における画像圧縮手段の他の実施形態の量子化制御部７ａの内部構成を詳細に示すフローチャートである。本実施形態の量子化制御部７ａでは、下限値の条件をとりあえず考慮せずに係数決定を行う。ＧＯＰレート設定時にあるＧＯＰレートが最小転送レートを下回るレートとなったときにそのＧＯＰレートに符号量を付加して最小転送レートに持ち上げ、この際に本来の転送レートと最小転送レートの差分を格納する。このＧＯＰ以降の符号化の際に目標ＧＯＰレートを低く設定（係数を小さく）することで、発生符号量を目標以下に抑制し、符号量に余りが生ずるようにする。ここで生成した余りを前述した最小転送レートへ持ち上げるために付加して消費した符号量に割り当てることでトータルとして符号量が同量になるようにする。これにより係数設定時の処理を軽減する（条件が１つ減る）ことができる。

【００１７】各マクロブロックの目標符号量に合わせて量子化部７、７ａで量子化値のフィードバック制御を行う。各マクロブロックの目標符号量は仮符号化で得られた実際の符号量に基づいているので制御は安定して行える。図５は、固定転送レート（図５ａ）、従来の可変転送レート（図５ｂ）及び本実施形態の可変転送レート（５ｃ）のそれぞれの時間と符号量の関係を示すグラフである。図５に示すように、ＧＯＰ毎の転送レートを求めるときに上限値と下限値を設定することにより、固定転送レートと比較して、圧縮符号化を簡単に行うことができる静止画に近いような画像に対して画質の劣化を抑制することができ、かつ圧縮符号化に向かない画像（動きの激しい画像）に対して画質の向上を図ることができる。つまり符号量の下限値を設定することで符号量が少ない部分の量子化値が低くなり、本実施形態によると従来の固定転送レートと可変転送レートの間をとるような量子化値の制御ができる。固定転送レート、従来の可変転送レート及び本実施形態の可変転送レートの各画像に対する画質の関係は次のようになる。

【００１８】静止画：固定転送レート＞本実施形態＞従来の可変転送レート

動きが激しい画像：従来の可変転送レート＞本実施形態＞固定転送レート

【００１９】図６は下限値を低く設定した場合（図６ａ）と高く設定した場合（図６ｂ）の時間と符号量の関係を示すグラフである。図６ａのように下限値を低くすると〔最小転送レート０ｂｐｓ（bit per second）に近づけると〕、発生符号量が多い画像に多く符号量を割り当てることができ動きの激しい画像の画質が向上する。また下限値を高く設定する（最小転送レートを平均転送レートに近づける）ことで発生符号量が多い画像に多く符号量を割り当てることはできないが、発生符号量が少ない画像に符号量を割り当てられるので静止画のような画像の画質の劣化が抑制できる。このように最大転送レートは同じ値でも下限値の設定で符号量の割り当てを変更できる。

【００２０】

【発明の効果】本発明は、画像を可変転送レートにより符号化する方法において、目標転送レートの上限値に加えて下限値も設定し、画像群毎に割り当てられる符号量を所定値未満に減少させずに画像圧縮を行うことを特徴とする画像圧縮方法である。この手法によると、従来技術と同じように、上限値により複雑な絵柄に割り当てる符号量を多くしてこの複雑な絵柄の画質を向上させられるだけでなく、下限値により簡単な絵柄に割り当てる符号量が必要以上に低くならないようにしてこの簡単な絵柄の画質の劣化を最小限に抑制することができる。従って使用可能な符号量の全てを最も効率良く使用することができ、従来にないレベルの画像圧縮が可能になる。

【００２１】又本発明では一連の画像圧縮工程の間、上限値及び下限値を一定値に固定しておく必要はなく、工程中に処理している画像に対応して両方又はいずれかを増減させるとより適切な画像圧縮が実施できる。更に本発明方法では必ずしも下限値を設定する必要はなく、最小転送レートとの差を差分メモリに格納して、過剰分を不足分を補うために使用することにより全体としての画質劣化を抑制するようにしても良い。又本発明装置は、動き補償部、離散コサイン変換部、量子化部、符号化部、量子化制御部を含んで成り、該量子化制御部において目標転送レートの上限値及び下限値を設定して画像群毎に符号量の割当てを行い、この割当てられた符号量に基づいて量子化部で適切な量子化を行うことを特徴とする画像圧縮装置であり、この装置を使用することにより同様の理由で比較的複雑な絵柄の画像の画質をほぼ維持したままで、簡単な絵柄の画像の画質の過度の劣化を抑制できる。

【図面の簡単な説明】

【図１】本発明の一実施形態の画像圧縮方法の一連の工程を示すフローチャート。

【図２】図１の仮符号化及び符号化の各工程の関連を示すフローチャート。

【図３】図２の量子化制御部の内部構成を詳細に示すフローチャート。

【図４】本発明の他の実施形態の画像圧縮方法の一連の工程を示すフローチャート。

【図５】固定転送レート（ａ）、従来（ｂ）及び本実施形態（ｃ）の可変転送レートにおける時間と符号量の関係を示すグラフ。

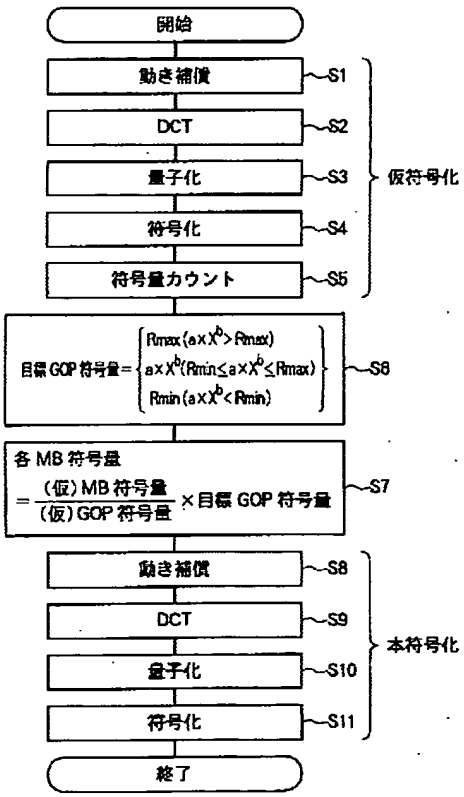
【図６】本発明の実施形態において下限値を低く設定した場合（ａ）と高く設定した場合（ｂ）の時間と符号量の関係を示すグラフ。

【図７】従来の画像圧縮方式を例示するフローチャート。

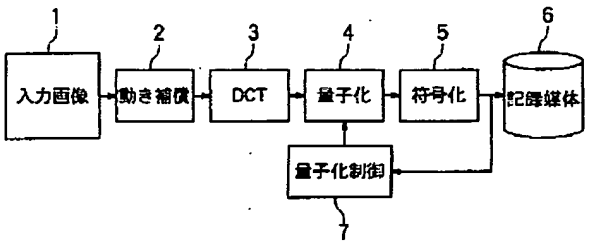
【符号の説明】

1　入力画像
2　動き補償部
3　離散コサイン変換部
4　量子化部
5　符号化部
6　記録媒体（蓄積メディア）
7　量子化制御部
７０１　符号量カウンタ
７０２　符号量メモリ
７０３　ＧＯＰレート設定部
７０４　符号割当部
７０５　標準量子化値

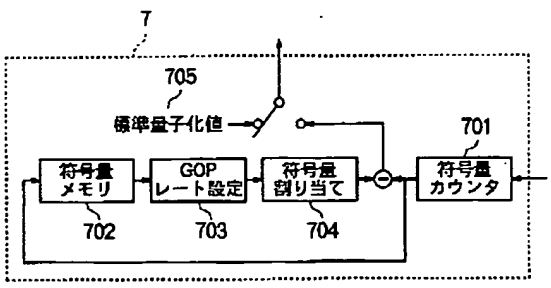
【図１】



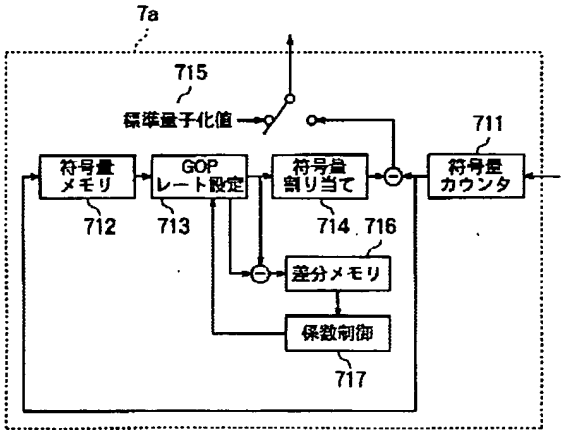
【図２】



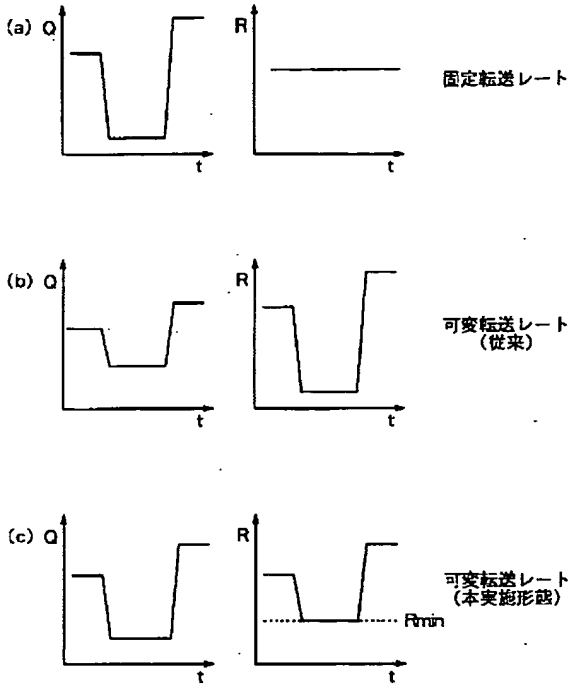
【図３】



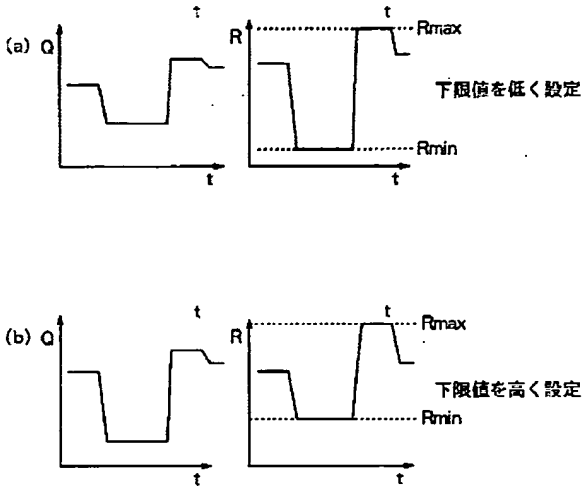
【図４】



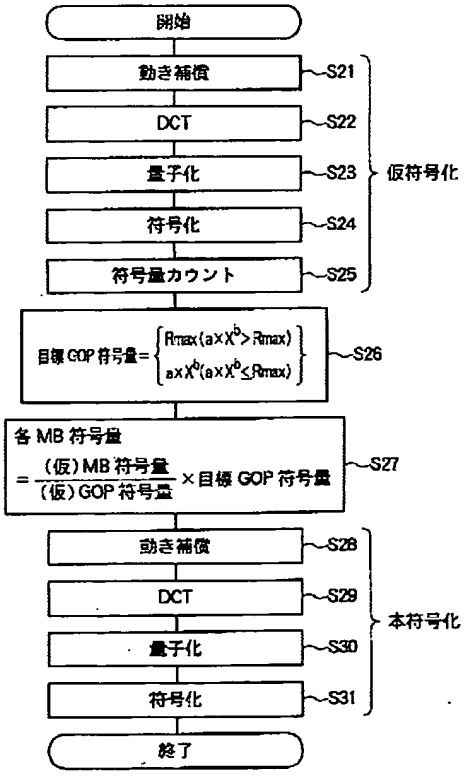
【図5】


(a) Q
R
t
固定転送レート
(b) Q
R
t
可変転送レート
(従来)
(c) Q
R
Rmin
t
可変転送レート
(本実施形態)

【図6】


(a) Q
R
Rmax
Rmin
t
下限値を低く設定
(b) Q
R
Rmax
Rmin
t
下限値を高く設定

【図7】


開始
動き補償
S21
DCT
S22
量子化
S23
符号化
S24
符号量カウント
S25
仮符号化
目標GOP符号量={Rmax(a×X^b>Rmax) / a×X^b(a×X^b≦Rmax)}
S26
各MB符号量
=(仮)MB符号量/(仮)GOP符号量×目標GOP符号量
S27
動き補償
S28
DCT
S29
量子化
S30
符号化
S31
本符号化
終了

フロントページの続き

Fターム(参考) 5C059 KK01 MA00 MA05 MA23 MC11
MC38 ME02 PP01 PP04 TA46
TA57 TB03 TC01 TC10 TC37
TD02 TD16 TD17 UA02 UA32
5C078 AA04 BA57 CA21 DA00 DA01
DA07
9A001 EE04 EE05 HH27